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(54) System and equipment for the manufacture and filling of flexible sterilizable bags.

(57) The system foresees the sequence phases: film feeding from at least one reel; the eventual print; the washing in two stages by ultrasonic vibrations and water; the drying; the alignment; the treatment by ultraviolet rays; a plying at 270°C on one or more films in parallel; the application of at least one valve; a first welding; a punching; the print of the batch number; the filling of the bag with liquid and inert gas; a second welding orthogonal to the former one; the cut and, preferably, the test in line; the packaging under vacuum and/or megablister; and the final cut. The machine necessary for the realization of the system includes, among other equipements, the film unwinding unit supplied with braking device, at least one ultrasonic washing tank and at least a tank with water nozzles fed from a closed circuit with distilled water; a film alignment device preceding the folding prism at 270°; a double filling pipe and a test band synchronous with the main transport roller.

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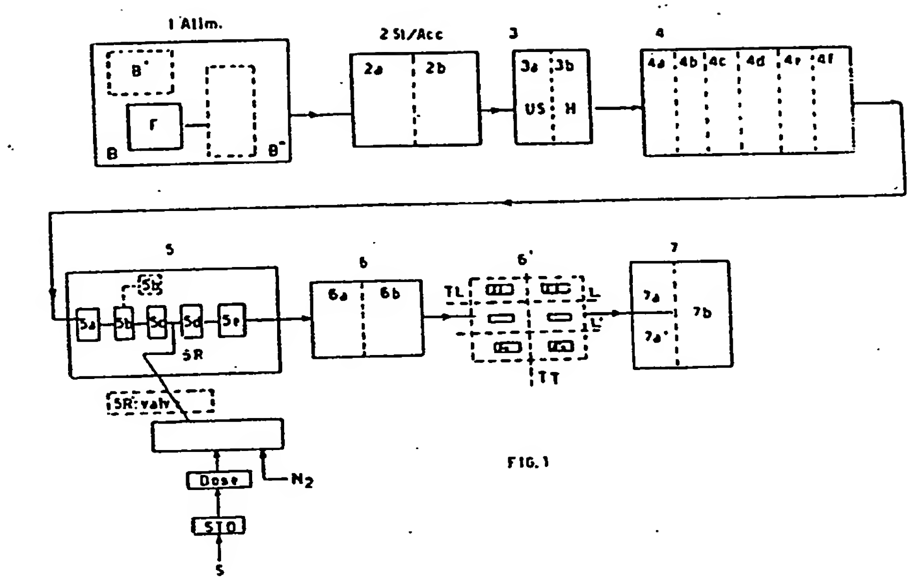
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F
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3a
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4c
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5c
5d
5e
5R
5R valv
Dose
STO
S
N2
6
6a
6b
6'
TL
L
L'
TT
7
7a
7a'
7b

FIG. 1

1.

"SYSTEM AND EQUIPMENT FOR THE MANUFACTURE AND FILLING OF FLEXIBLE STERILIZABLE BAGS"

1. Field of the invention

The present invention relates to a system for the manufacture of bags of flexible material, each one provided with at least a valve and holding liquid batches, in particular a perfusional solution or the like.

2. Statement of the Prior Art

Many systems for forming flexible bags and their filling with liquid are well-known, in particular the US Patent No. 4.326.574 of the Assignee describes a process in which the plastic film generating the bag is unwound from a reel, is washed in a tank holding a solution of polyphosphate in ionized water, is pressed between rubber rollers, is dried and treated with ultraviolet rays into a drying-sterilizing chamber, is folded, supplied with a valve, welded a first time in longitudinal direction, filled with liquid, welded in transverse direction and cut.

This system shows certain advantages, but joined with some practical drawbacks.

Continuing its research in the field, the Assignee has setup a system that allows to get excellent results in the different characteristics of productivity, quality and safety and test and a drastic reduction of scraps, energy consumptions and size.

2.

SUMMARY OF THE INVENTION

Now the system according to the invention is characterized in

that the film unwound from a reel having width multiple with respect to the one of the ended bag is submitted to a print and winding and then to a washing in two phases; the first washing phase is carried out by the action of ultra-sounds, while the second one is got substantially under the action of a water jet; and the said film washed in this way, after drying, punching and sterilization by means of UV-rays, is plied at 270° and after the descent by transport, undegoes the phases of welding, filling and application of valves and then also a stamping; the so stamped bags, filled and welded are submitted to a collection and test phase, then undergo either a partial stiffening of one of their bands or a packaging preferably under vacuum into an external envelope.

Other typical features of this system are characterized in the relevant underclaims.

Further the invention includes a machine characterized in that it embraces: in the feeding station, a film unwinding unit supplied with a braking device that controls the wished film tension; in the washing unit, at least a washing ultrasonic tank and at least a washing tank with water jets, fed by means of a closed circuit system that uses distilled water, filtering continuously it with possibilities of partial reinstatement; in the treatment station, in addition to the drying and winding rollers, a film alignment device that precedes the folding prism at 270°, ensuring the execution precision; in the forming and filling unit, the feeding of the solution in the various bags by means of a double filling pipe, the second circuit being used for the replacement of the air with

inert gas during the final closing phase of the bag; in the test station the ended bags are submitted to an integrity test by means of a conveyor moving in synchronism with the main conveyor that applies an adjustable pressure on the bags during their passage.

2.

BRIEF SUMMARY OF THE DRAWINGS

The various features and advantages of the present invention will appear more clearly in the description of some (preferred and not limitative) embodiments represented in the annexed drawings, in which:

- the fig. 1 is a block diagram of the process;
- the fig. 2 is a kinematic scheme corresponding to that one of the fig. 1;
- the fig. 2A is an additional variant of the scheme shown in fig. 2;
- the fig. 3 is a schematic and partial axonometry that shows a preferred layout of the stages and means for carrying out the process according to the fig. 1;
- the fig. 4 is a plan view of one machine applying the process according to the schemes of fig. 1 and 2A and including the elements of fig. 2;
- the figures 5, 6 and 7 are front (schematic and partial) views of the machine of fig. 4 in the directions of the arrows X, Y and respectively Z of the said fig. 4.

3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Making reference to the figures 1, 2 and 3, the system accord-

ing to the invention is substantially represented by at least 5 stations each including one or more treatments. In particular the block 1 shows the phase, respectively the film feeding unit F drawn from a reel B; the dashed rectangles show the possibility of installing at least a second reel B' in the unit 1 in parallel to the former reel B and having the same width of this last one, or a reel B" having a width equal to n times the width of B or B'. The unwinding reel is joined with a tension adjusting device including a braking mechanism DF; the block 2 shows the phase, respectively the print (2a) and winding (2b) units of the film F coming from the reel B and/or B' or B"; the block 3 shows the phase and respectively the washing unit that, according to a notable feature of the invention, consists of two separated stages 3a and 3b in which the film F is submitted to an ultrasonis washing US (3a) and a washing (3b) with distilled water injected by nozzles 3' fed by pumps 10 and filters 12, each pump 10 being connected to the feeding source of the distilled water by valves or cocks 10' (fig. 2). Preferably the feeding of the said distilled water is realized in the closed circuit type and includes the means for the partial liquid reinstatement. When more reels B, B' etc., having the same width, or a reel B" having width n times greater than the former ones are used, the units 2 and 3 are suitable for operating contemporaneously on the whole film; the block 4 shows the film treatment divided in 6 underphases that foresee: the drying (4a), the winding (4b); the sterilization by ultraviolets UV (4c); the alignment (4d), the folding (4e) and the transport device (4f).

The figures 2 and 3 show the means for getting these operations that are represented respectively by a couple of squeezing rollers 4a, by the conventional series of winding rollers 4b, by the UV lamp joined with rolles 4c, by the alignment rollers 4d, by the folding prism PR introduced between the rollers 4e and at last by the tension roller 4f cooperating with the second folding roller 4'e; the block 5 shows the phases, respectively the forming unit of the valve bag with contemporaneous filling of the said bag: these underphases and respectively the single station means, are shown with: 5a the first welding, 5b the valve application, 5c the film stamping with incision of the validity number, 5d the second welding made in longitudinal direction with respect to the former one, 5e the cut. Preferably, between the underphases 5c and 5d, it is carried out the underphase 5r of bag filling by the introduction of the solution S coming from the stocking STO by means of the dosing pump DOS. When the filling of the dosed liquid is over it is introduced a little nitrogen volume coming from the source N_2 through the filter F'_1 into the superior head of the bag. When more reels or a reel having width B" are used, the filling phase SR' will be made by a series of nozzles I installed in parallel.

The phase 6 foresees an underphase 6a collecting the filled and separated bags STP that come out vertically oriented by 5e, e.g. on a conveyor NT and a test underphase 6b; the figures 2 and 3 show the test member, represented by a pressure rollers couple RP suitable for carrying out the "integrity test".

At last the packing phase 7 includes preferably an underphase 7a that applies an "overwrapping" envelope and/or a phase 7a' of at least partial stiffening of a bag band, an underphase 7b of deposition of the single bags on a support or megablister, a plurality of which can be arranged into holding packages or stacked for the stocking.

It must be observed that, when the process is realized using reels having width n, the machine will be provided not only with n fixing devices for the valves (5b)n and (5R')n filling needles and further with n dosing devices (DOS)n and further with a phase or understation 6' in which it is made the final cut of the bags from S_1 to S_n that come out contemporaneusly from the test station 6b. This final cut can be made longitudinally along the line L, L' and L", or transversally along the line T.

Considering the first case, that is using the longitudinal cut, there are advantages in the feeding of the sterilization unit (not represented as it is downstream 6b), as the bags aligned longitudinally can pass directly and continuously in the sterilization unit.

Considering the second case, that uses the transversal cut, some advantages are got in the automation of the movements generated in the following work phases (e.g. three bags at a time in rigid support, whereby it is got a substantilly rigid body having the box shape).

The fig. 2 shows with 7' the packaged and transversally cut bag group, each bag being already introduced into its external envelope with or without vacuum application.

The figure 2A shows the film F coming from at least one reel B, that undergoes the print phase 2a before passing into the winding unit 2b; this substation of print is represented only in a schematic way. Among the more important advantages of the above mentioned system according to the invention, it is necessary to mention that have appeared critical not only the double washing phase 3a (ultrasounds) followed by 3b (water washing), but above all the coordination of all phases and this fact allows, among other matters, to work with a very high productivity on a contemporaneous bag plurality at a parity of final product quality.

A particularly advantageous practical embodiment of a machine for carrying out the process according to the figures from 1 to 3 is represented in the figures from 4 to 7 in which STO shows still the solution tank; DOS shows the relevant dosing pump; Fi shows the filters of the filling solution; B shows the film feeding reel; 2b the winding unit; 3 shows the washing tank divided in two sections 3a (with ultrasounds US) and 3b (with water), 4 shows the winding, alignment and sterilization unit in which it can be well noticed the part 4d with the ultraviolet lamp ULV and further the folding prism PR (4e); 5a shows the longitudinal welder; 8 shows the film transport roller couple towards the welding unit; SP shows the transversally welded bags, 5c is the print device; PH shows the photocell for the control of the stamping 5b; 5d shows the universal welder; 21 the ultrasound welder for the closing of the film; 20 shows the "closurer vibrating hopper"; TR shows the filling tube; N_2 shows the nitrogen tank and 26 N_2 the

relevant injection head; 23 is the electric cab; 22 is the relevant panel with instruments and pilot lamps; 13 shows the box with hydraulic controls: 17 bis is the tensioning arm; 18 is the little adjustment arm for the horizontal displacement.

The invention was described for clarity's sake with reference to the preferred embodiments, represented in the drawings but it is not limited to these embodiments as it is susceptible of all changes, modifications and replacements that, being within the reach of the mean skilled technician, fall naturally within the spirit and scope of the following claims.

CLAIMS

1) Process for the continuous production of bags of flexible synthetic or artificial material and for the contemporaneous filling with liquid into the same bags during their manufacture, in which process a bag forming film is unwound from one reel; it is washed in a tank, pressed between rollers, dried, treated with ultrasonic vibrations, bended, supplied with valves, welded a first time in longitudinal direction, filled with liquid, welded in transverse direction and cut, characterized in that the film unwound from at least one reel having a width multiple than the one of the ended bag and undergoes a print and winding phase and thereafter the washing in two phases; the first phase is got by ultrasounds action, whilst the second one is got by water jets; and this

washed film, after drying, winding and sterilization by UV rays, is folded at 270° and, after descent by transport through the welding, filling and valves application phases, undergoes a stamping; the bags so stamped filled and welded are submitted to a winding and test phase, then they undergo either a partial stiffening of one of their faces or a packaging preferably under vacuum into an external envelope.

2) Process according to the claim 1, characterized in that it is carried out with reel having width n times higher than the one of the ended bag, with n folding devices at 270° located in parallel among themselves, n valve feeders, n liquid batchers, n filling nozzles and with final longitudinal or transverse cut of the finished bags.

3) Process according to the former claim characterized in that the bags with external envelope are applied on a support of the blister type.

4) Machine for the realization of the system according to claim 1, characterized in that it includes: in the feeding unit, one film unwinding unit provided with braking device that controls the wished film tension; in the washing unit, at least one ultrasonic washing tank and at least one washing tank with water nozzles, which is fed by a closed circuit system that uses distilled water and filters it continuously with partial reinstatement possibility; in the treatment station,in addition to the drying and winding rollers, a film alignment device which precedes the folding prism at 270° and ensures its execution precision; in the forming and filling station, the solution feeding into the bags by a double

filling pipe, the second circuit being used for replacement of the air with inert gas during the final bag closing phase; in the test unit, the finished bags undergo an integrity test by means of a band that moves in synchrony with the main transport roller, applying an adjustable pressure on the bags during their passage.

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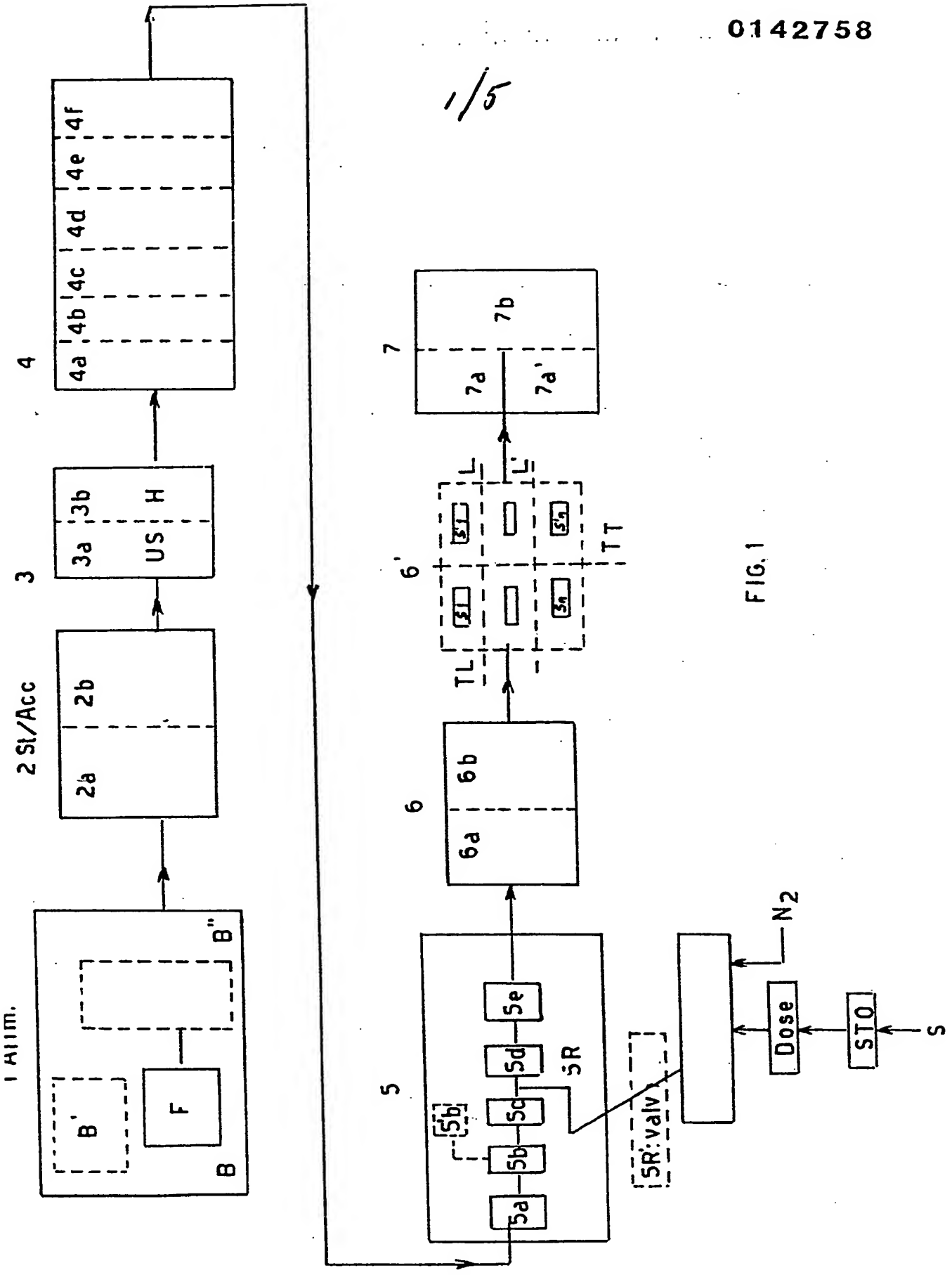
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F
B"
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US
3b
H
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4d
4e
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5a
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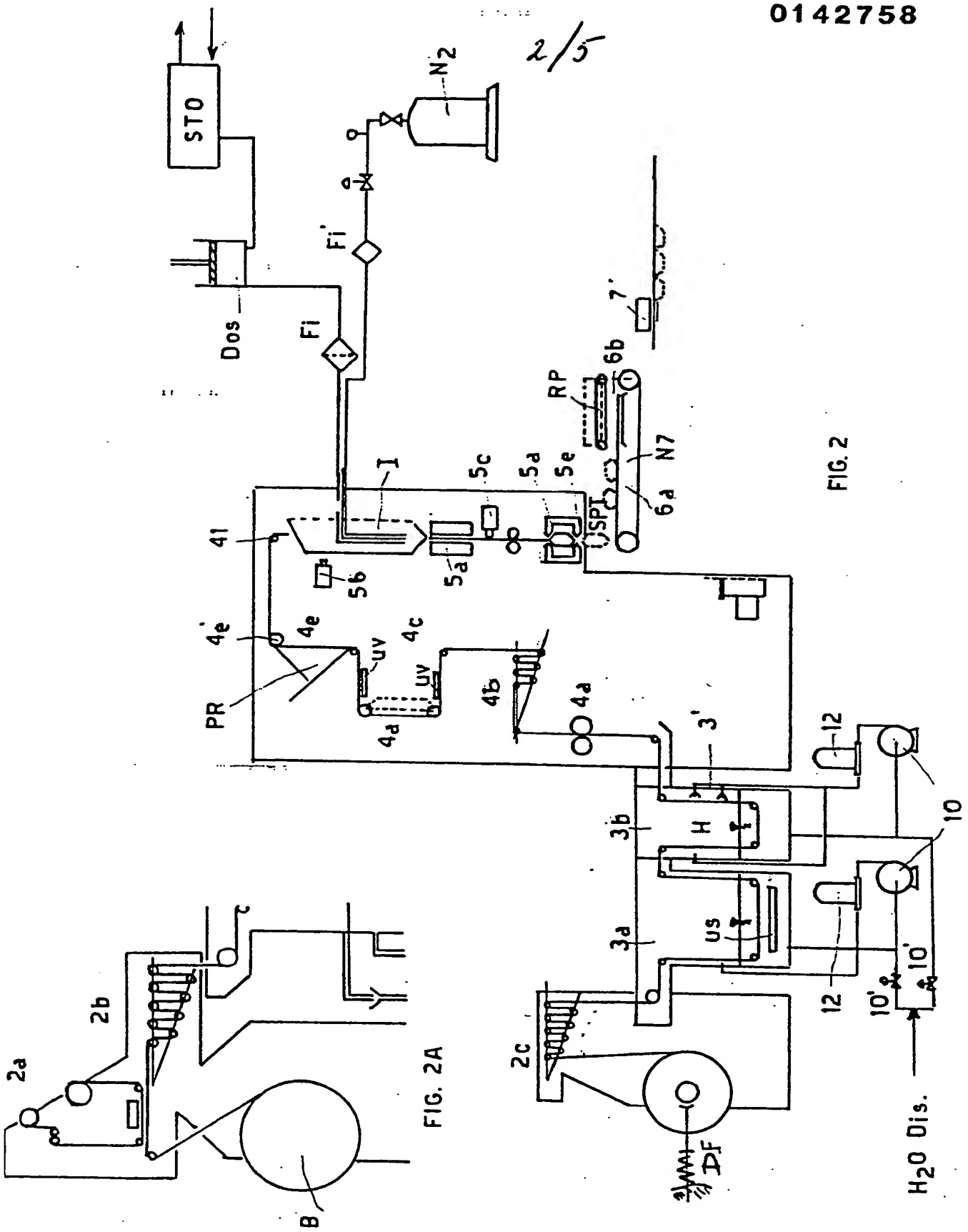
5R: valv
6
6a
6b
6'
TL
TT
L
L'
7
7a
7a'
7b
N2
Dose
STO
S

FIG. 1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Fi
7'
6b
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5a
5e
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5b
5a
4e'
4e
4c
UV
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4b
4a
3'
12
3b
H
10
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2a
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B

FIG. 2

FIG. 2A

3/5

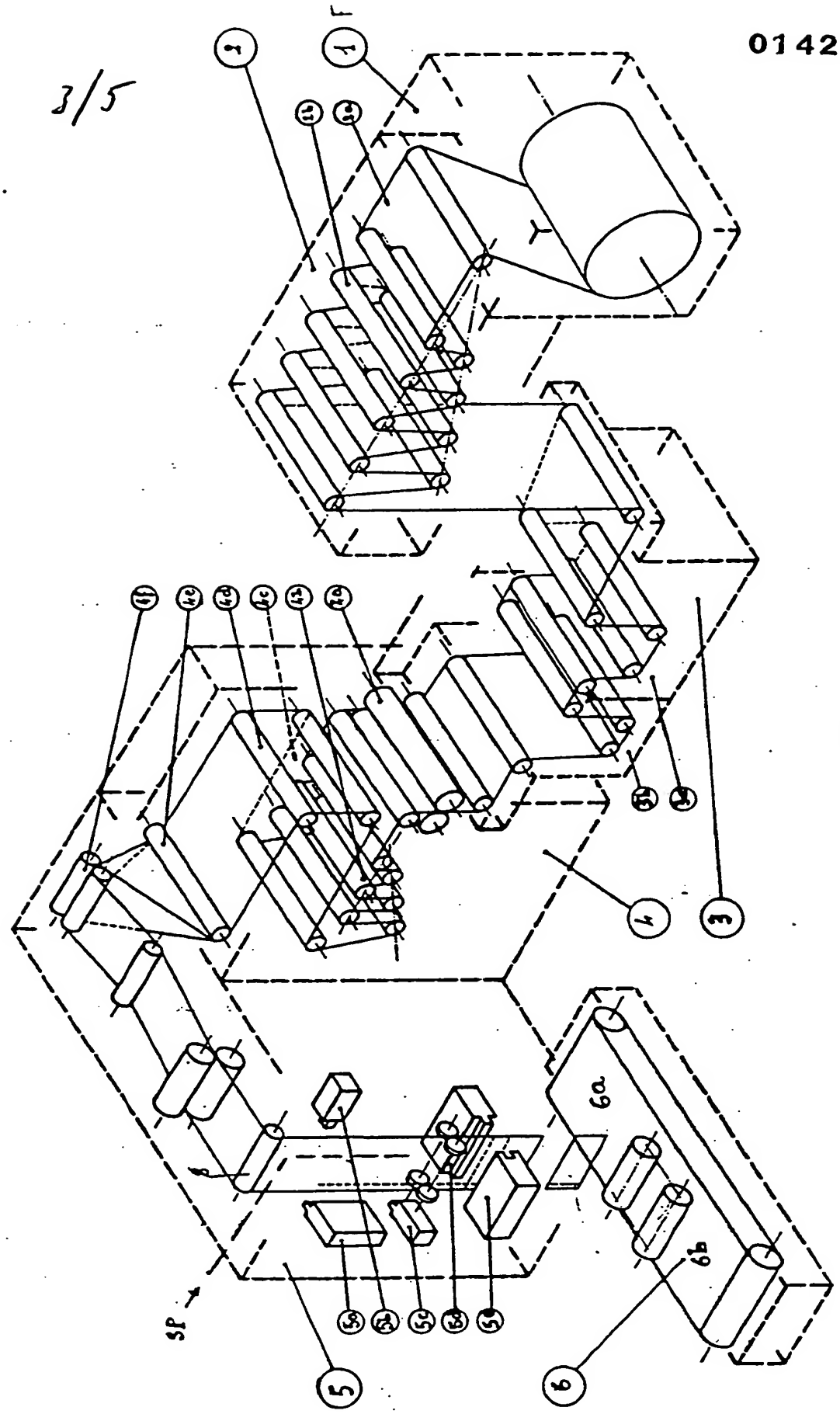

FIG. 3

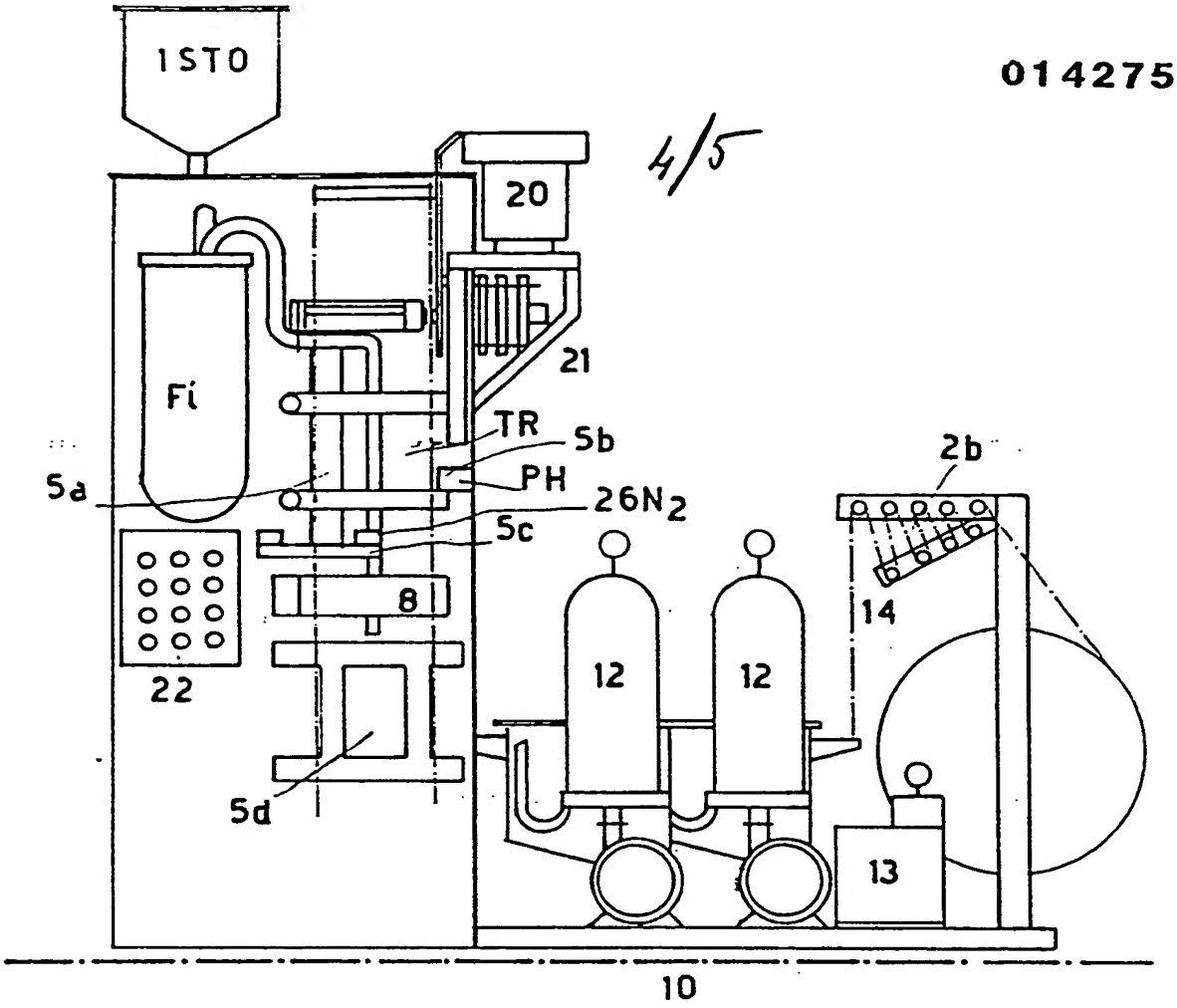
1STO
20
21
Fi
TR
5b
PH
26N2
5a
5c
8
22
5d
12
12
2b
14
13
10

FIG. 5

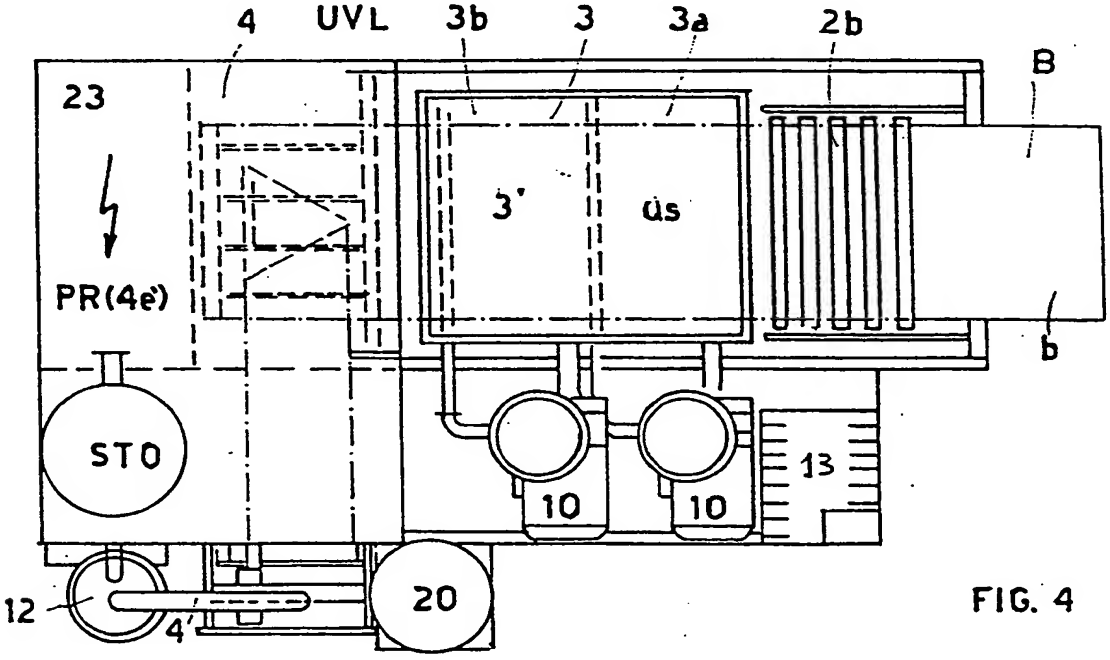
4
UVL
3b
3
3a
2b
B
23
3'
ds
PR(4e')
b
STO
10
10
13
12
4'
20

FIG. 4

5/5

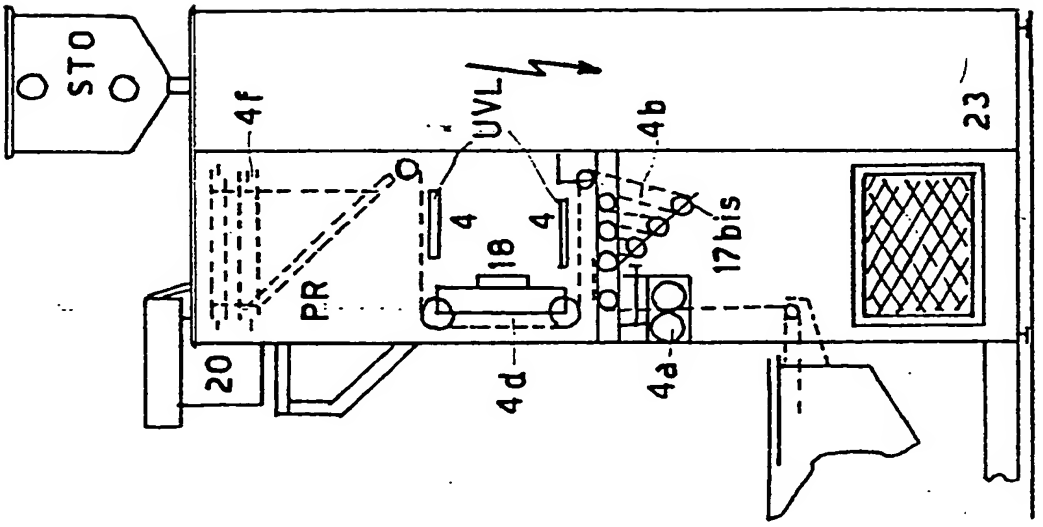

FIG. 7

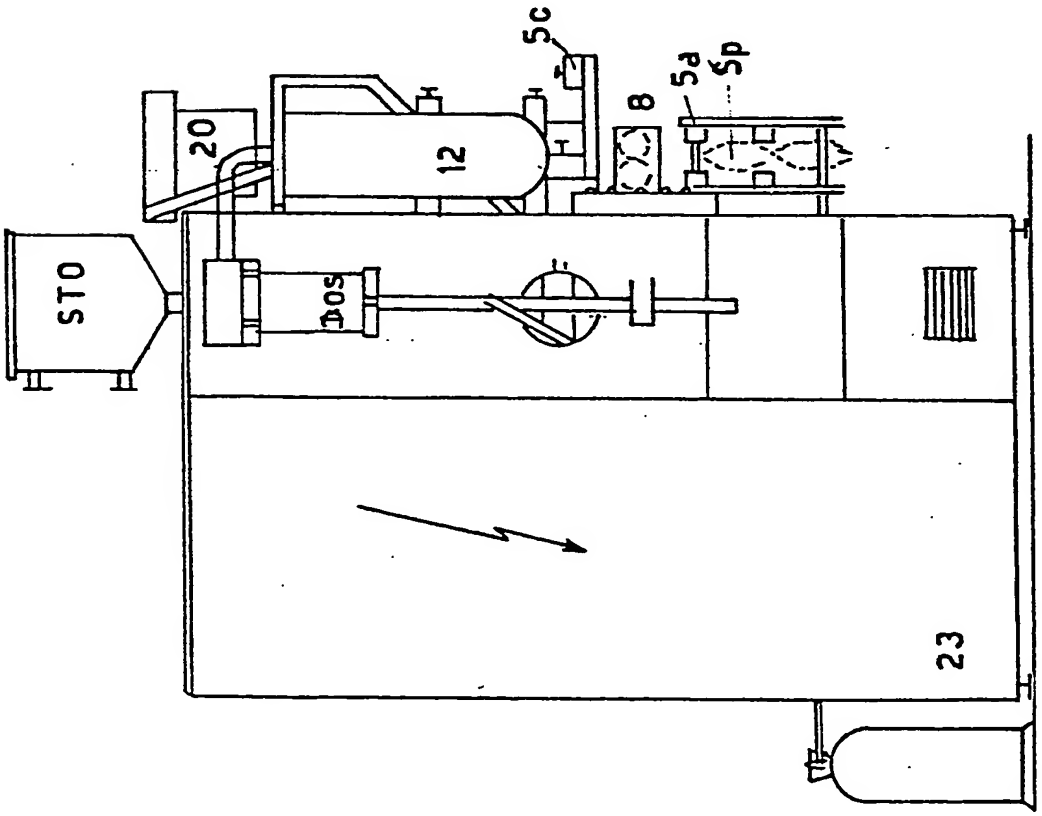

FIG. 6